CWMS System Backup / Oracle Backup and Recovery

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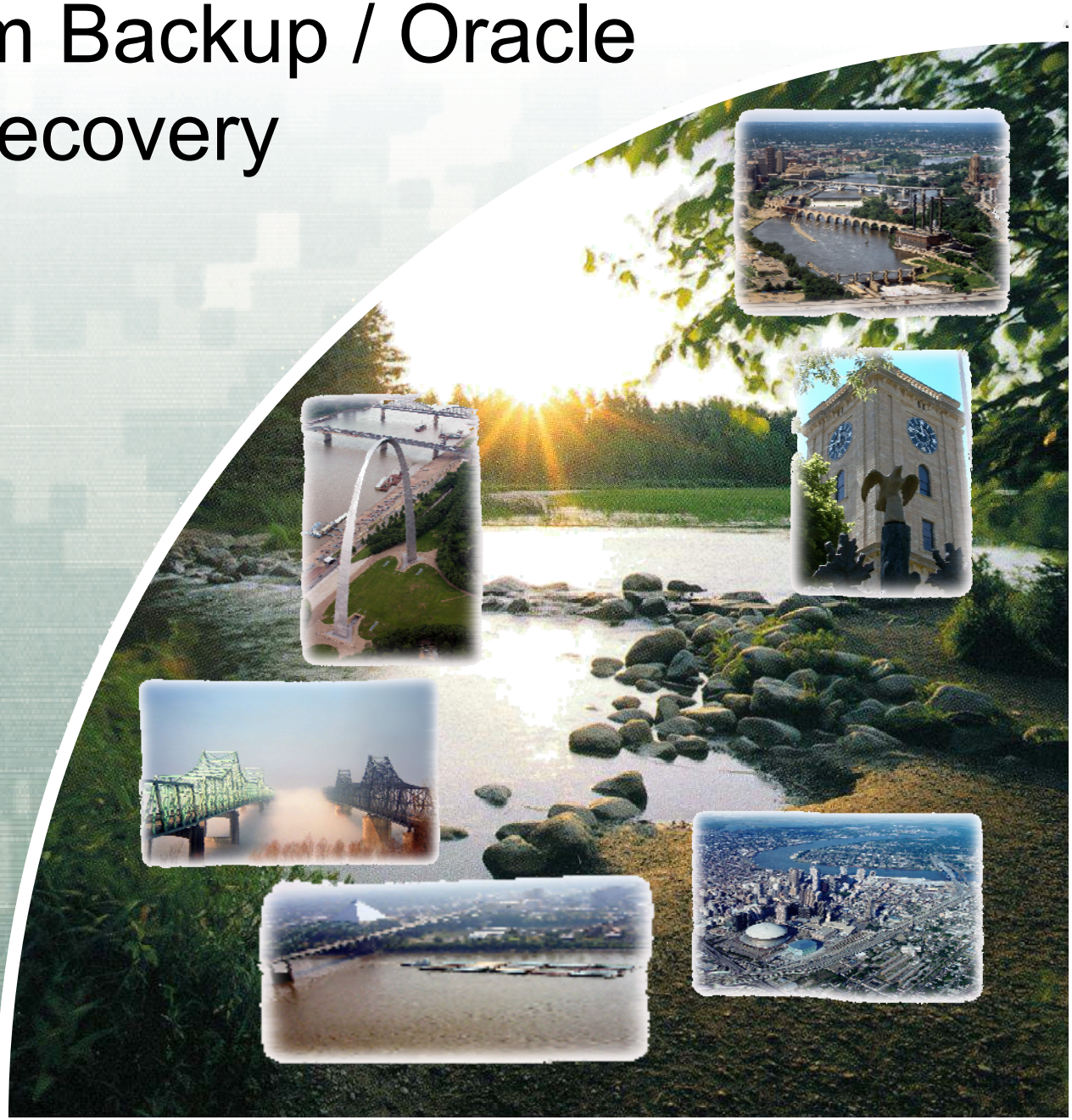

US Army Corps of Engineers

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Summary

- Backup Needs of Water Management
- Illustration of Quick Application Recovery/Backup Process that does not interfere with WM operations
  - MVS Downtime is about 10-20 minutes for Oracle Cold Backup
- ACE-IT and WM Team Backup Approach and Scheme
  - ACE-IT – US Army Corps of Engineers – Information Technology
- Oracle Recover Manager (RMAN) – Backup, Recover, and Restore

Continuity of Operations

- Water Management
  - MVS - 24 hour / 7 day a week operation
  - Because of operational requirements – Data and application unavailability is not acceptable
    - Especially during:
      - Emergency operations (24-hr operation)
      - Low water operations (24-hr operation)
      - Forecast duties
      - L&D Pool Fluctuations (Overnight Management)

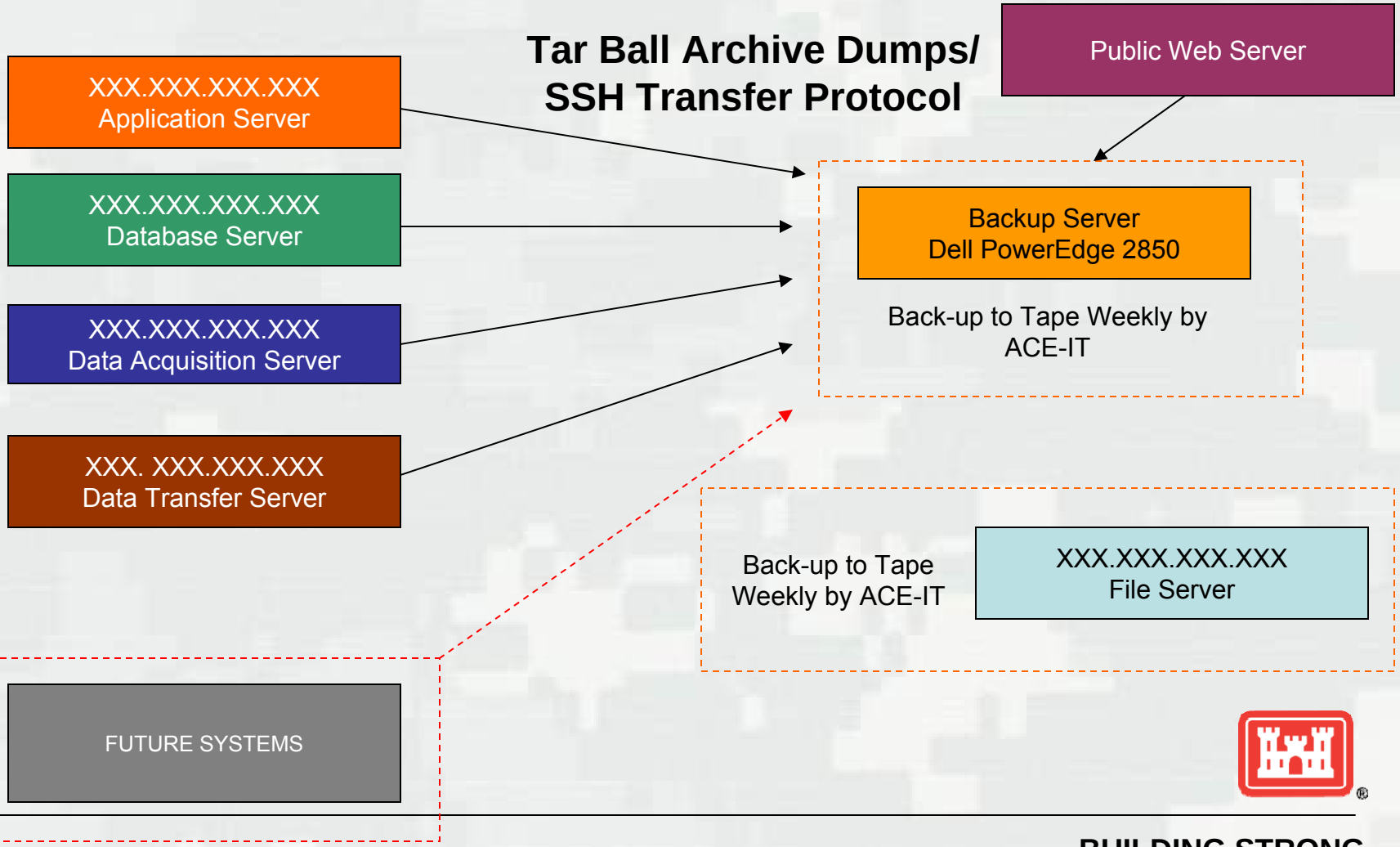
Backup Needs

- No interference to operational forecast
  - Run most backup scripts in the 1600-2000 time frame
  - Oracle 0100 – 0230 (Tuesday Morning)
- Quick and Simple file recovery
  - Digging through tapes not really appealing.
- Track backups organized by date.
  - Track changes on a daily basis
- Need for tape backup management scheme
  - Catastrophic Recoveries - Have to start moving tapes to a government protected backup facilities

MVS Local ACE-IT and WC System Administration

- WM never really had a good backup management plan prior to now.
- Team approach to backup Management.
  - ACE-IT Responsibility
- Because of the complexity of the WCDS and operational requirement variances:
  - WC System Administrators need to provide some degree of backup management assistance
  - Avoid operational interferences

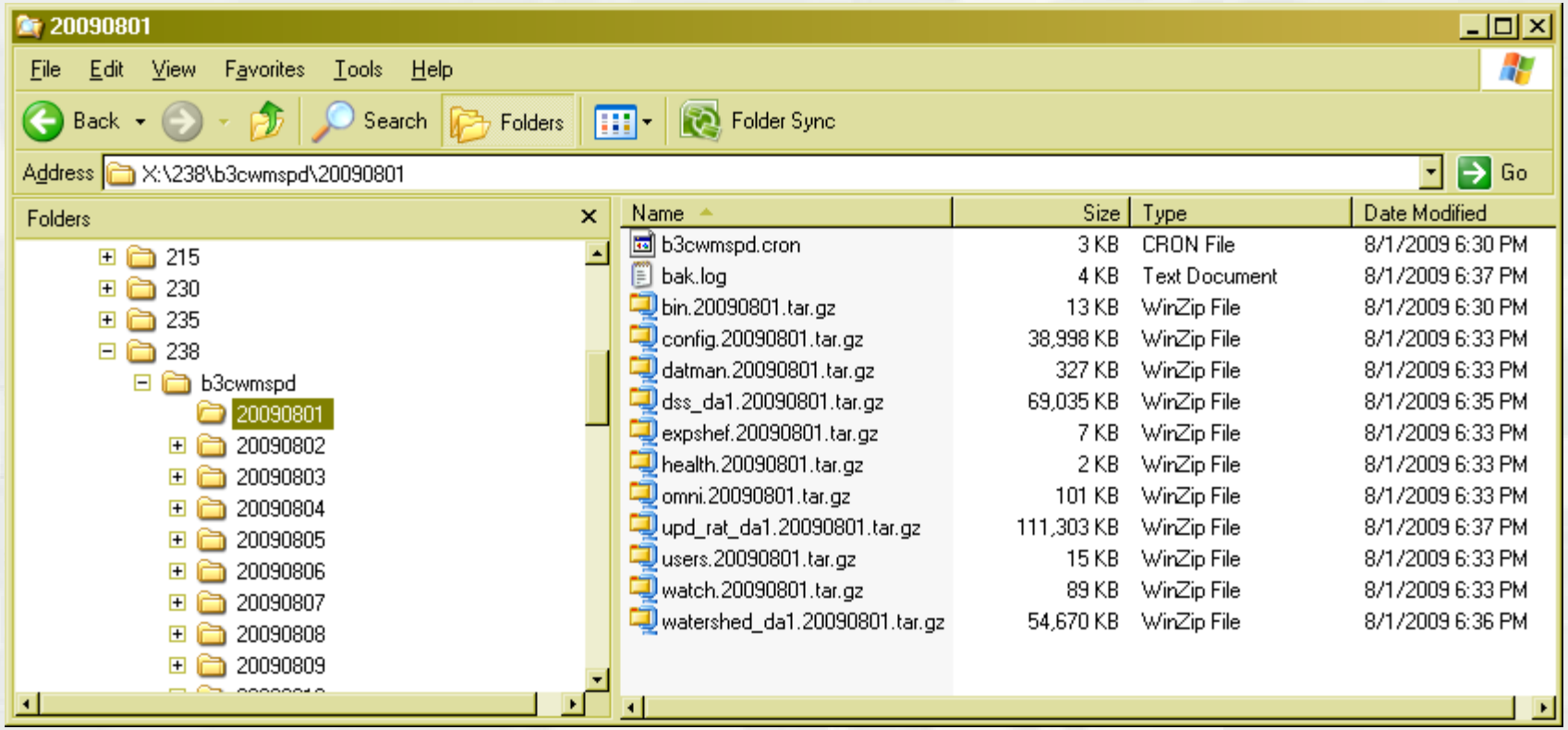
Backup File Server



Why Centralized Backup Scheme?

- Shell Script controlled by WM SA's
  - WM SA can determine best time with current operational needs
  - Most automatic
- Tar Ball (tar.gz) archive
  - Date track directory archives
  - Great for quick file recovery
- WM Tape backup occurs during the day
  - Backup time does not interfere with rest of the district.
  - Managed by ACE-IT
- Archive termination can be managed by script or manually

Backup Archive File Structure



Drive Space Requirement for MVS File Server fluctuates between:

130 G -170 G

300 G - RAID 5 File System

ACE-IT Tape Backup Scheme

- Equipment
  - ARCSERVE 12.5
  - DELL 113 slot six LTO4 backup tape library
- Grandfather-father-son (GFS) Tape rotations
  - With weekly offsite storage
  - The primary purpose of the GFS scheme is to maintain a minimum standard and consistent interval at which to rotate and retire media. (oldest media first.)
    - Daily backups - Son
    - A full backup is performed at least once a week – Father
    - The last full backup of the month (monthly backup) - Grandfather

Oracle Backup Schemes CWMS V1.5 or Oracle 9i Release 2

- HEC Original Plan
  - ► Shutdown DBI/CWMS DB
  - ► Tar Oracle directories
    - Large files, not simply managed

- Oracle 9i r2 Recommended Plan
  - ► RMAN (Recovery Manager)
    - Shutdown DBI – MOUNT CWMS DB
    - Compressed Backup
    - Manage archives and logs

RMAN Backup Procedure CWMS v1.5

- Pre-configuration:
  - Archive Log Mode is required for POINT IN TIME RECOVERY.
    - Archive Logs track database changes.
    - Slight performance loss from default system when switching to archive log mode.
      - Have not noticed any adverse consequence.
    - Not difficult to configure.
      - spfile modifications through SQL statements.
    - **Definitely worth it - Especially at times of recovery!**
  - Configure RMAN Auto Backup of Control Files
    - Control file Management are good ways to manage the recovery of a single database
    - Automatically generated at times of backup

RMAN Backup Procedure CWMS v1.5

- As Root user:
  - su to bXcwmspd:
    - stopDBI or StopCWMS
  - su to oracle [Cold Backup Task]:
    - Start RMAN
    - shutdown database; startup mount
    - backup database (incremental = 0) - (10 minutes, 20 G)
    - delete obsolete arc logs; delete old backups
    - open database
  - su to bXcwmspd:
    - startDBI or BootCWMS
    - Reload missed data streams
    - Transfer files to backup file server - (1 hour)

Basic RMAN Recovery and Restore

- **Recovery and Restore is Simple:**

```
1. Login to RMAN target database
2. Shutdown immediate; startup mount
3. RESTORE DATABASE;
4. RECOVER DATABASE;
    • Point in time options:
        • Or RECOVER DATABASE UNTIL TIME <date>;
        • Or RECOVER DATABASE UNTIL SCM <xxxxx>;
5. ALTER DATABASE OPEN RESET LOGS;
```

  - **MVS Database has been restored in less than 1 hour.**
    - ► Dependent on how far you are from Cold Backup

Recovery and Restore Experiences

- Tablespace file corruptions
- Tablespace did not automatically expand and was corrupted.
- cwms.at_time_series_value index disappeared?
  - ►recovery faster then rebuild
- Historic data sets deleted